Challenges to Relying on Carbon Capture & Sequestration (CCUS) for Industrial Decarbonization

Presentation to the Louisiana Climate Task Force

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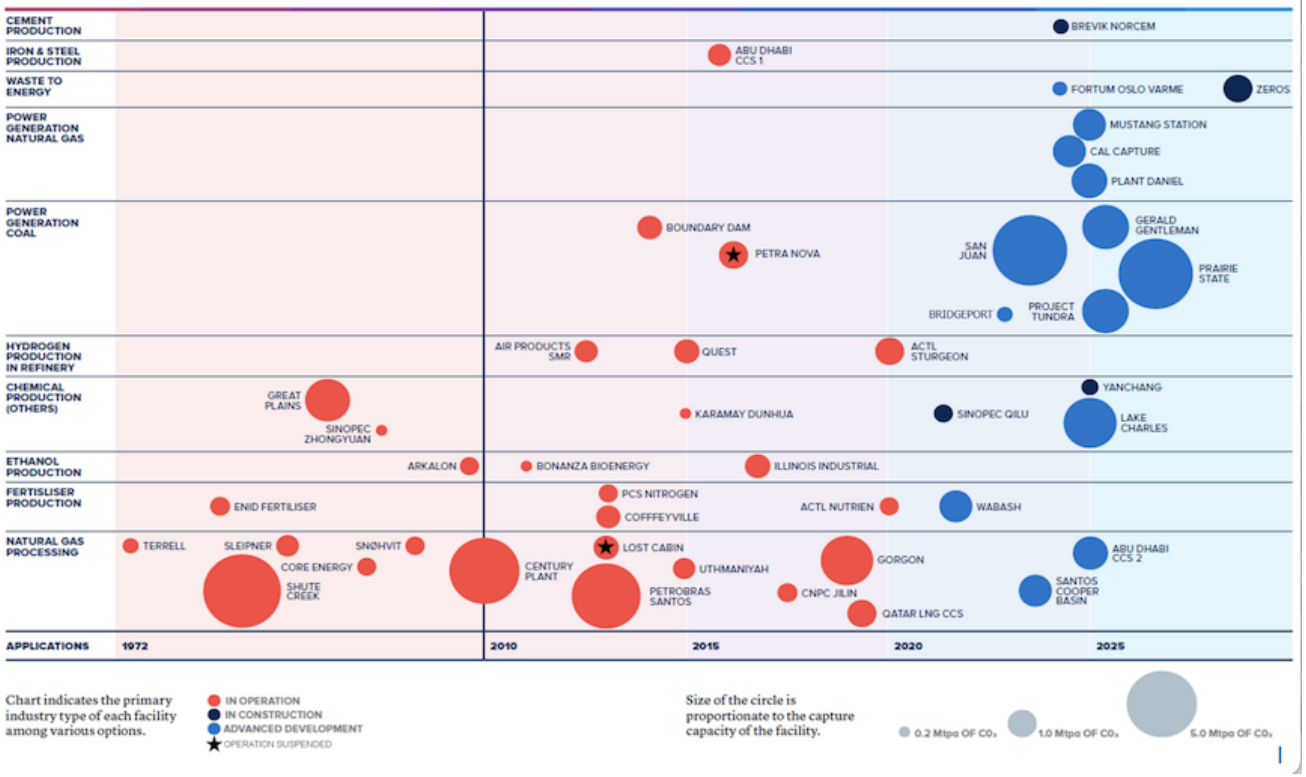
There Really is Only Limited Recent Experience with CCUS at Industrial Facilities

- 66 commercial CCS facilities: 26 operating, 4 under construction, 34 under development, 2 with operations suspended.
- Almost 40 million tonnes of CO_2 captured annually from 26 commercial CCS facilities currently in operation.



Note that there is only a single CCUS project at a steel plant and none that capture CO_2 at a cement plant.

Source: Global CCS Institute Update, April 28, 2021

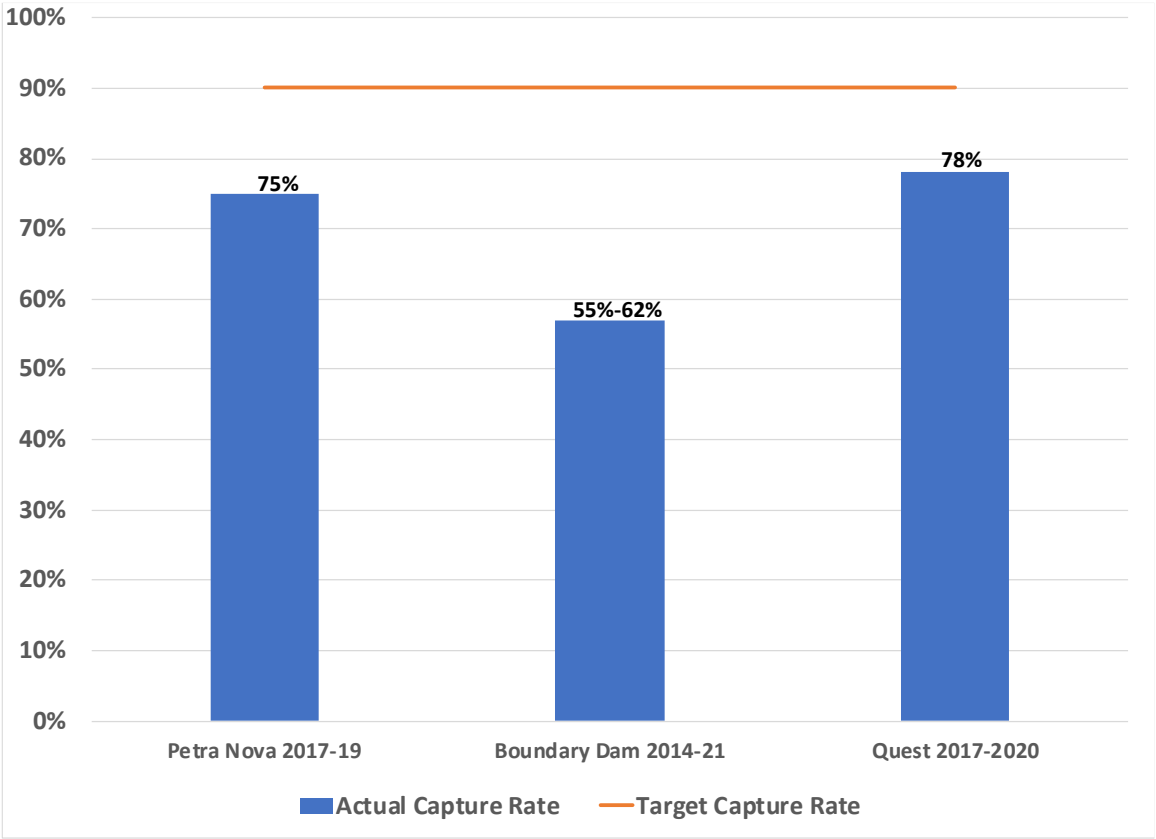
But There is Little Information on these CCUS Projects Beyond How Much CO_2 They Capture Each Year

1. Only 3 of the projects have reported what percentage of the CO_2 they produce is captured – their "capture rates."
2. We have only found 2 that report the types of equipment problems they have experienced with their carbon capture facilities.

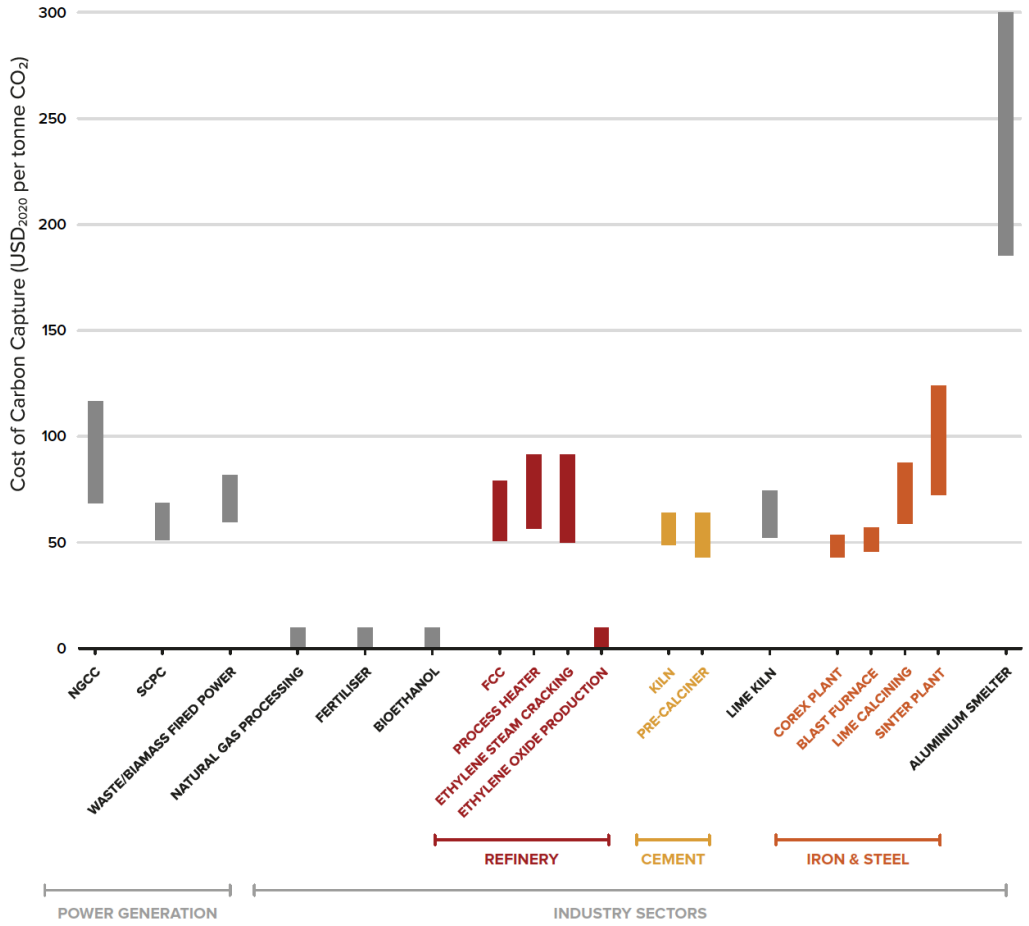
   Thus, it is not tracked how proven or reliable the technologies the rest of the projects have used to capture CO_2 have been.
3. Only 2 have reported, even indirectly, any information about their profitability.

The Information We Have Found Suggests that Projects May Not Be Meeting Targeted Capture Rates

A 90% target rate is the Holy Grail for carbon capture – the lower the capture rate, the more CO_2 is emitted into the atmosphere.



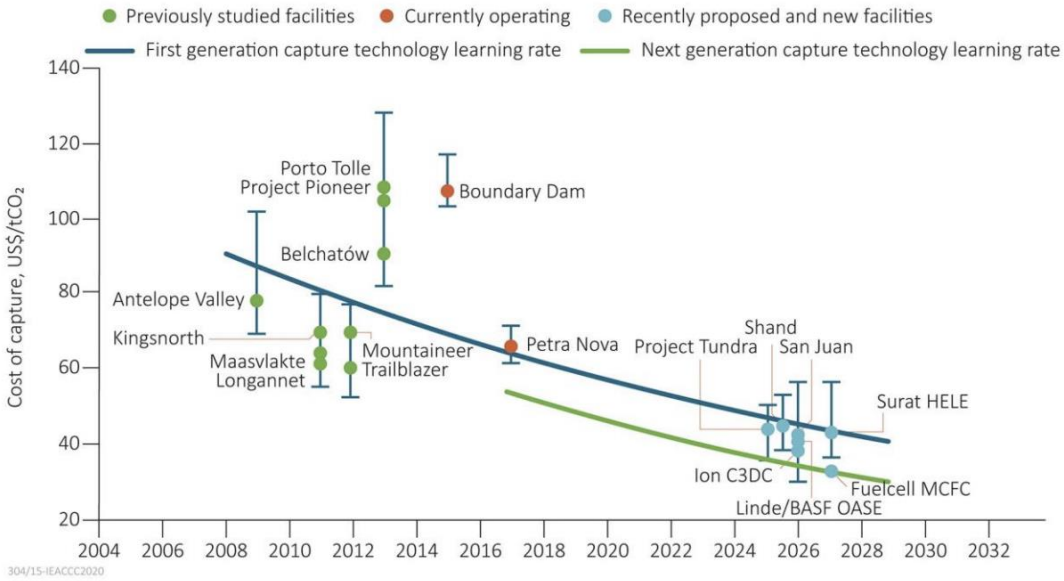
Estimates of How Much CCUS Will Cost In Various Industrial Sectors Show Significant Uncertainty



Source: Global CCS Institute Update, April 28, 2021

There is No Evidence that Reductions in the Costs of Capturing CO_2 Have Actually Been Achieved

- U.S. Dept. of Energy and CCUS proponents report the actual cost of capturing CO_2 from coal plants has been $60-$65 per metric ton.
- CCUS advocates admit this cost is far too high and must be reduced to about $30 per metric ton by 2030 to be financially viable.
- CCUS advocates have used charts like this to claim there already is a declining trend in the cost of capturing CO_2 – however, this chart is misleading.
- Only the estimates of future CO_2 capture costs have declined. No new projects capturing CO_2 from coal plants have been built.
- CO_2 concentrations in the flue gas from gas plants is much lower (~4%) than from coal plants (~14-15%). Therefore, capture can be expected to be more expensive.



GCCSI analysis based on 8% discount rate, 30 years project life, 2.5 years construction time, capacity factor of 85%. Fuel prices were based on the reported data in the project feasibility and FEED reports. Cost data normalised to 2017 values.

Figure 15 Levelised cost of electricity for large-scale coal power generation plant with post-combustion carbon capture (Zapantis and others, 2019)

Note: These capture costs estimates do not include the costs for drilling, compressing, transporting, injecting and monitoring geologically stored CO_2 – which have been estimated to add another $20-$25 per ton to the total cost of capture and storage. But that's only an estimate.

Other Challenges (1)

1. Timing - once again this summer has shown the dramatic need to reduce CO_2 emissions as quickly as possible, including those from the key emitting industrial sectors – steel, petrochemical and cement.

   There is great uncertainty regarding how long it will take to design, build, test, and then bring a new industrial CCUS facility with a new technology on-line and demonstrating that it functions effectively and reliably. This process should be expected to take at least 5 years, but possibly longer. Thus, new facilities to capture industrial or power plant CO_2 should not be expected to be in service until 2026, if not later.

2. Using complex new technologies can lead to unanticipated costs and unexpected problems during both construction and operation. Many of the CCUS projects can be expected to be one-of-a-kind or first-of-a-kind designs due to differences in industrial processes and/or industrial plant designs. That would add risk to them.

   For example, Southern Company promised that a new coal gasification technology and pre-combustion carbon capture at the Kemper power plant in Mississippi would reduce the plant's CO_2 emissions by more than 65% or 3.3 million tons per year. However, the new gasification process was so unreliable during testing that neither it nor carbon capture are used and no CO_2 has been captured at the plant.

Other Challenges (2)

3. Burning fossil fuels to power carbon capture equipment, the compressors along CO_2 pipelines or its injection into underground storage will lead to additional CO_2 emissions that must be considered in determining the overall benefits from CCUS. Renewable resources should be used instead wherever possible.

4. Only six of of the CCUS projects currently in operation inject the captured CO_2 in dedicated underground storage. The remainder use the CO_2 for enhanced oil recovery (EOR). The additional oil produced thru EOR leads to increases in CO_2 emissions when that oil is burned or used as a petrochemical feedstock. Thus, it is unclear whether the capture of CO_2 at any of these projects actually leads to overall net reductions in CO_2 emissions.

5. A number of critical legal and political issues need to be addressed:

   - Will communities, farmers and ranchers be willing to accept the siting of the large number of new pipelines that will be needed to transport captured CO_2 to underground sites.
   - Who will be responsible for monitoring and preventing leakage of the stored CO_2 underground? And be responsible for the liabilities associated with damage from leaks?

Recommendations

While CCUS may eventually become a vital contributor for reducing CO_2 emissions in the industrial sectors, it will likely be years before we know how much of a contributor it can be—and at what cost. Continued studies can and should be pursued. There are likely to be different solutions for different industries.

But time is of the essence: The world needs to reduce CO_2 emissions immediately.

Measures that can be undertaken and completed more quickly need to be implemented now. These measures include, but aren't limited to, energy efficiency measures, demand management (strategic timing of industrial processes with high energy use to avoid peak energy use times of day), and fuel-switching from fossil fuels to renewable sources. Do what we can now.

For More Information

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